

- PATENT -

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Spear et al. EXAMINER: Hyun, S.  
SERIAL NO.: 09/274,941 GROUP: 2663  
FILED: 03/23/99 CASE NO.: CE03880R  
ENTITLED: METHOD FOR TRANSPORTING MULTIMEDIA INFORMATION  
IN A COMMUNICATION SYSTEM

Motorola, Inc.  
Corporate Offices  
1303 E. Algonquin Road  
Schaumburg, IL 60196  
February 13, 2004

**DECLARATION UNDER 37 C.F.R. § 1.131**

Certificate of Transmission under 37 CFR 1.8	
I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office.	
on <u>February 19, 2004</u>	<u>2/19/2004</u>
Motorola, Inc.	Date
Name of applicant, assignee, or Registered Representative	
<u>Donald R. Babin</u>	
Signature	

Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Now comes Sanjay Gupta, who declares and states:

1. That I am an inventor of the subject matter claimed in the above-identified U.S. Patent application.

2. Prior to January 29, 1999, I had completed the invention described and claimed in the above-identified U.S. Patent application, as evidenced by the following facts: Prior to January 29, 1999, while in the course of research and experimentation at Motorola, Inc., and in association with Stephen Spear, my co-inventor in the above-identified U.S. Patent application, I had prepared and characterized an invention for sending and receiving multimedia information in a communication system as evidenced by a Patent Disclosure form, dated July 23, 1998, that Stephen Spear and I submitted to Motorola, Inc. A copy of the Patent Disclosure form is attached to this Declaration. One embodiment of our invention provided for receiving a multimedia stream at a mobile station, splitting the multimedia stream into multiple component pieces or multiple streams at the mobile station, applying Layer 2 protocol or functionality to each component piece or stream and applying channel coding to the component piece or stream at the mobile station based upon whether the component piece or stream comprises one or more of audio, video, and data, and transmitting the component pieces or streams. Another embodiment of our invention provided for receiving multiple streams that together form a multimedia session, decoding, based upon whether the content of each individual stream comprises one or more of audio, video, and data, the multiple streams to form multiple decoded streams, and performing Layer 2 functionality upon each of the multiple decoded streams based upon whether the content of each individual stream comprises one or more of audio, video, and data.

3. The date of the Patent Disclosure form that Stephen Spear and I submitted to Motorola, Inc., that is, July 23, 1998, is prior to January 29, 1999, that is, the date of the Ahmadvand patent, U.S. patent no. 6,477,670, cited by the Examiner in rejecting our application in an Office Action dated December 17, 2003.

4. The undersigned Declarant declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to



be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

5. Further Declarant saith not.

Sanjay Gupta  
Sanjay Gupta

Feb 13, 2004  
Date

**MOTOROLA**  
Radio Telephone Systems Group

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## DISCLOSURE FOR PATENT COMMITTEE

SUBMITTED PURSUANT TO EMPLOYMENT AGREEMENT

FOR INSTRUCTIONS FOR COMPLETION REFER TO  
DISCLOSURE INSTRUCTION PROCEDURE

Inventor(s) will not fill in

Operation

J. Campbell

DISCLOSURE NO.

CE03880R

DATE

7/23/98

Patent Committee Action

Inventor(s) Name(s)

Spear, Steve

Gupta, Sanjay

Inventor must fill in items 1 thru 13. Items 2 to 5 may require extra sheets.  
BE SURE that all attachments are signed and dated by both the inventor(s) and witnesses.

## 1. Name of the invention. (Limit to ten words.)

Adaptation to support multimedia communications in a Packet Switched Cellular Network

## 2. State the problem(s) solved by the invention.

See Attached

## 3. Describe the invention, including its operation, purpose and environment. (Use separate sheets as required).

See Attached

## 4. List the closest known technology (attach article, patent, catalog sheet or other documentation).

See Attached

## 5. Improvement(s) over known technology.

See Attached

## 6. What new elements (e.g. components, circuits, process steps) or combination of known elements or software algorithm produced the improvement?

See Attached

## 7. What are the potential applications for use of this invention?

See Attached

## 8. Conception date? April 1998 (Attach earliest log sheets, drawings, etc., to support dates).

## 9. To whom did you first disclose this invention? Name: Philip Gilchrist Date: July 15, 1998

10. Date the device was first built and tested. No  
Present location of the device?

DETERMINATION OF LEGAL INVENTORSHIP WILL BE BY THE PATENT DEPARTMENT.

Inventor's signature (IMPORTANT - YOU MUST USE YOUR FULL NAME) - NO INITIALS-

## 11. Inventor's Full Name: (Type):

Stephen Spear

Signature

Date

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12. Inventor's Full Name: (Type): <u>Sanjay Gupta</u>	Signature <u>[Signature]</u>	Date _____	Social Security No. <u>161-70-4436</u>	
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Citizen of (i.e. U.S., Germany, etc.) <u>India</u>	Dept. No. <u>BD 537</u>	Phone <u>847-435-0306</u>	Room No. _____	Employee Status <input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Contractor
Inventor's Immediate Supervisor <u>Antony Susai</u>	Dept. No. <u>BD 537</u>	Phone <u>847-632-3972</u>	Social Security No. <u>470-94-2310</u>	

13. Inventor's Full Name: (Type)	Signature	Date	Social Security No.	
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Inventor's Immediate Supervisor	Dept. No.	Phone	Social Security No.	

Witness signatures (TWO WITNESSES ARE REQUIRED). Witness must sign and date this form and all attachments.

THE WITNESSES IN SIGNING THIS FORM ATTEST TO THE FACT THAT THEY UNDERSTAND THE INVENTION.

14. Witness Name: (Type) <u>Antony Susai</u>	Signature <u>[Signature]</u>	Date <u>2/17/04</u>	Phone <u>2-3972</u>
15. Witness Name: (Type) <u>Timothy M. Jones</u>	Signature <u>[Signature]</u>	Date <u>2/17/04</u>	Phone <u>2-5712</u>

Items 16 thru 24 are to be filled in by the ENGINEERING/PRODUCT MANAGER or above.

THE MANAGER IN SIGNING THIS FORM ATTESTS TO THE FACT THAT HE UNDERSTANDS THE INVENTION.

16. What product will this invention be used in? (No code names - use brief description if necessary)  
Motorola GSM GPRS and UMTS Products17. When (was) (will) the first offer for sale of a product incorporating this invention (be) made?  
Date: 2Q 200018. When is the estimated shipping date? 2Q 200019. When (was) (will) the first disclosure outside of Motorola (be) made? How and to whom? Nondisclosure agreement signed? State title and date of publication, if any.  
Customer presentations IQ 199920. What is the market for products incorporating this invention? Be specific and quantitative.  
Digital Cellular Networks Worldwide21. Who are the potential competitors? What is the possibility this invention will be used by competitors? Which ones?  
Ericsson, Nokia, Nortel, Siemens, and other GSM cellular network suppliers. All may use the invention.22. Did this invention result from work on a development Contract? (YES) (NO) Contract No. \_\_\_\_\_  
Who was the contracting party? \_\_\_\_\_

23. Discuss the business impact that this invention will have on Motorola. Be specific and quantitative.

24. Manager's Name (Type) <u>Donald E. Benkeser</u>	Signature <u>[Signature]</u>	Date _____	Dept. No. <u>BD 537</u>	Phone <u>847-435-0137</u>
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RTSG-IPPO-117-O

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**1. Name of the Invention.**

"Adaptation to support multimedia communications in a Packet Switched Cellular Network."

**2. State the problem(s) solved by the invention.**

Multimedia communications involves simultaneous use of one or more media services (such as voice, video, data, etc.) in a single communication session. Recently, a number of standards, such as H.323 have been defined that address the requirements for multimedia communications in a wireline packet switched network. Recently, GPRS, a packet switched network overlaid on the existing GSM network, has been standardized by ETSI.


Given the above trends in the wireline and wireless communications there is an increased desire to support multimedia applications in wireless cellular networks. Further, in the interest of fixed-mobile convergence there is an emphasis on employing (or reusing as much as possible) existing wireline protocols for wireless networking applications.

While it is possible to provide the multimedia services transparent to the wireless network there are various problems associated with support of multimedia applications in wireless applications:

- (i) In wireline applications traffic from the various component media streams are treated the same. However, in wireless networks, different media streams must be treated differently for optimum performance. For instance, the channel coding used is usually dependent on the media being transported. Further, different Quality of Service objectives may be suited for different traffic streams (example, voice codecs may be more resilient to errors than video codecs).
- (ii) Wireless environments are typically poorer (when compared to wireline transmission channels) and further complicating matters is the fact that the channel error characteristics change quite rapidly. Transport protocols (such as TCP) in wireline networks are tailored for the relatively error free wireline environment and are unlikely to perform as desired in wireless environments. Retransmission is a means of improving end to end performance but is not appropriate for all media streams.
- (iii) The overhead associated with wireline protocols is significant (especially when used as is over currently defined wireless packet networking protocol stacks). This renders their use over scarce wireless transmission capacity a liability.

In short, the multimedia applications of today are designed

- (i) Without regard to bandwidth and overhead and
- (ii) In a manner such that the lower layers (Layer 1, Layer 2, and Layer 3) are not aware of the contents of the data they transfer (or the application that generated the data being transported by them).

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This is clearly inappropriate for wireless multimedia applications, since given the unpredictable nature of scarce wireless channels it is essential that the lower layers be tailored to meet the specific demands of the various traffic types.

**3. Describe the Invention, Including its operation, purpose and environment.**

This disclosure addresses the above mentioned problems by providing the lower layers (L1, L2, and L3) information about the nature of the contents of the data<sup>1</sup> being transported by them (which allows them to then provide service that is tailored for each data type). The proposed middle-ware allows the use of wireline applications on an end-to-end basis without the above mentioned liabilities.

This disclosure identifies appropriate middle-ware for both the Mobile Station (MS) and the Network Infrastructure that will enable:

- (i) multimedia applications to be transported efficiently over wireless networks;
- (ii) be able to use existing (and forthcoming features) designed to support single media streams in wireless networks;
- (iii) existing wireline multimedia standards to be used end-to-end.

The functions performed by the middle-ware include:

- (i) Separating the component media streams (of a multimedia session) before transporting them on the wireless network;
- (ii) Merging the component media streams received from the wireless network before forwarding it to the wireline network and/or the application at the MS;
- (iii) Adapting each component media stream to the wireless environment (alternate coding schemes for voice or video). This could possibly involve transcoding, filtering (for instance reducing the resolution of images, or data as performed by WAP) operations, or operations that make the media stream to be more suitable for transmission over a wireless channel.
- (iv) Requesting appropriate channel coding resources for each component media stream;
- (v) Requesting appropriate Link Layer retransmission scheme parameters for each component stream (for instance no retransmissions would be allowed for voice and video, whereas retransmissions would be mandatory for data);
- (vi) Performing header reduction techniques (potentially specific to each media stream). For IP traffic, known header compression could be used. Alternatively, a specific for transport of IP over wireless networks could be developed.
- (vii) Deletion of IP headers for specific PDP contexts. For instance, for the PDP context associated with the voice stream, the technique identified in disclosure CE03751R could be employed.

<sup>1</sup> Note that multiple traffic types are multiplexed in the same L3 traffic stream in a multimedia application.

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Note that

- (i) The use of proposed middle-ware allows existing bearers (designed for transporting single media streams) to be employed within a multimedia session.
- (ii) The proposed middle-ware could be located at either the BSS or the NSS in the network infrastructure. Further, it is possible that some functions are located in the BSS and the others in the NSS.

To facilitate proper operation of the middle-ware additional signaling between the two peer middle-ware entities (in the MS and the network infrastructure) is introduced. In order to communicate between the middle-ware components located in the BSS, L2 messages are most likely to be employed. For communication between the middle-ware components located in the NSS, L3 messages may have to be employed. Alternatively, the BSS can act as a proxy for the MS and communicate with the NSS, reducing the requirement for L3 messaging.

The contents of messages between the middle-ware entities include:

- (i) Identification of request for activation due to multimedia call
- (ii) Negotiation of coding for each component media stream
- (iii) Requested channel coding for each component media stream (in GPRS each component stream will most likely be associated with a unique PDP context<sup>2</sup> (note that this will require L2 signaling as identified in disclosure CE03751R)
- (iv) The L3 port/socket used for transmitting and receiving component media streams in the wireline network.
- (v) PDP context used for transporting various component media streams.
- (vi) Information necessary to provide the necessary synchronization between the component media streams.

An overview of the proposed call establishment procedure for a multimedia call for wireless network is outlined below. For simplicity, GPRS is assumed to be the underlying wireless transport network. The originating station, assumed to be an MS for the discussion here, activates a PDP context (in the GPRS network) for the multimedia session. Subsequently, the MS sends appropriate signaling messages to the destination and requests a multimedia session. Having received an indication of the ability of the destination station to accept the multimedia call request, the MS invokes this invention.

The MS requests the activation of a new (distinct from the one activated above) set of PDP contexts (one for each component media stream)<sup>3</sup> each with its own specific channel coding scheme (this is most likely to be performed via an in-band signaling mechanism). Subsequently, it transitions from a signaling only stage to the user traffic transfer stage.

<sup>2</sup> In GPRS an MS can have several PDP contexts active simultaneously.

<sup>3</sup> Note that this can optionally be performed prior to (or simultaneously with) sending the multimedia call request to the destination.

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Alternatively, the MS can recognize the request for a multimedia call and request the middle-ware residing in the network to setup a single multimedia call with the request for individual PDP contexts for each component media stream, as described above. In this case the BSS (or NSS) takes on a slightly enhanced role of agent for the MS to request the single multimedia session to the wired network while supporting multiple individual sessions over the air.

**4. List the closest known technology.**

The closest known technologies are:

1. Method to transfer voice on a packet switched cellular network as identified in disclosure CE03751R.
2. The mechanisms used in the Wireless Application Protocol (WAP) for efficient transfer of asynchronous data over wireless channels.
3. Mechanism for the in-band transmission of "control" information between the MS and the BSS when an MS is involved in a voice call in GSM.
4. In-call Codec negotiation for data services and in-call modification of a voice call to data and vice-versa.

**5. Improvement(s) over known technology.**

The proposed invention offers the following improvements over existing systems:

1. Enhanced quality (for each component traffic stream) when compared to the case in which component traffic streams are merged (as in wireline networks).
  - Allows the MS and/or the network to request channel coding resources appropriate for each component stream of a multimedia call.
  - Allows each component traffic stream to be transmitted without the addition of any overhead. This allows increased air interface capacity utilization.
  - The proposed middle-ware can also be used to reduce the overhead associated with transporting IP data traffic.
  - Allows the network to optimize each component media stream separately (perform transcoding, filtering, etc.)
2. Existing wireline applications can be continued to be used by the MS.
3. If the middle-ware is implemented in the BSS, there are no impacts to the Gb interface and the GSNs (both SGSNs and the GGSNs).

**6. What new elements or combination of known elements or software algorithm produced the Improvement?**

The following new mechanisms are needed to efficiently transport multimedia on a packet switched cellular system such as GPRS:

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1. Introduction of middle-ware at the MS and the network infrastructure. The middle-ware informs the Layer 1, Layer 2, and Layer 3 of the source (voice, video, and data) that generated the data being transported by them. This allows the lower layer to provide services that are tailored to each source type.
2. Functionality in the network and the MS to convert between the single multimedia PDP context stream and the multiple component media streams and the required control to support the above.
3. Additional signaling between the middle-ware residing at the MS and its peer entity residing in the network infrastructure. (Note that the middle-ware in the network infrastructure could be distributed over more than one physical entity.)
4. Ability of an MS to request for multiple PDP contexts all of which are associated with a single end-to-end multimedia call.
5. Changes in the transport plane as specified in GPRS currently. For instance, if the proposed middle-ware is implemented at the BSS, the BSS now terminates the IP, LLC and SNDCP layers on behalf of the MS.

## 7. What are the potential applications for use of this invention?

The invention can be used for:

1. Transferring multimedia applications on the GPRS network allowing seamless networking with existing wireline technologies.
2. It is expected that such a solution will also be used in UMTS for multimedia applications.

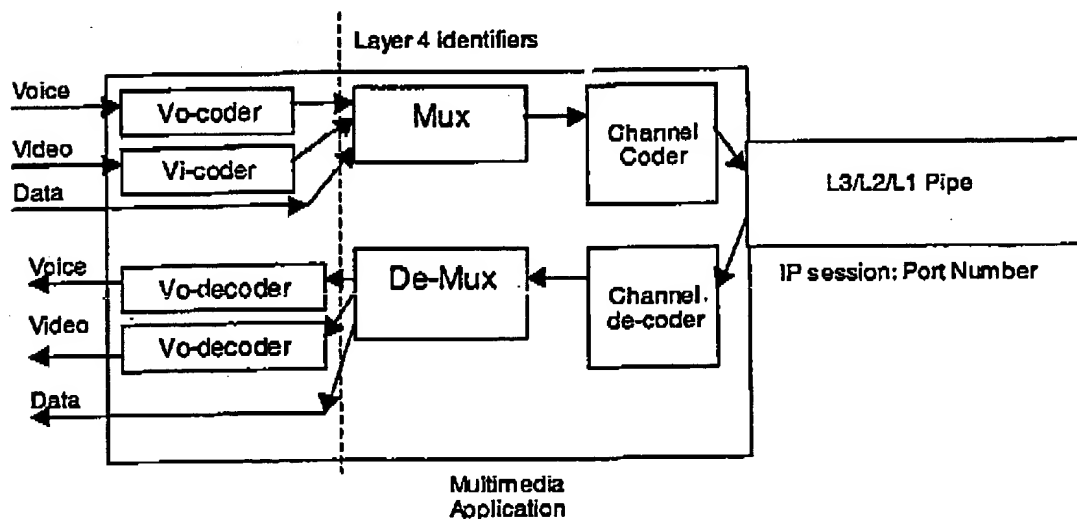


Figure 1: Multimedia Application before Invention

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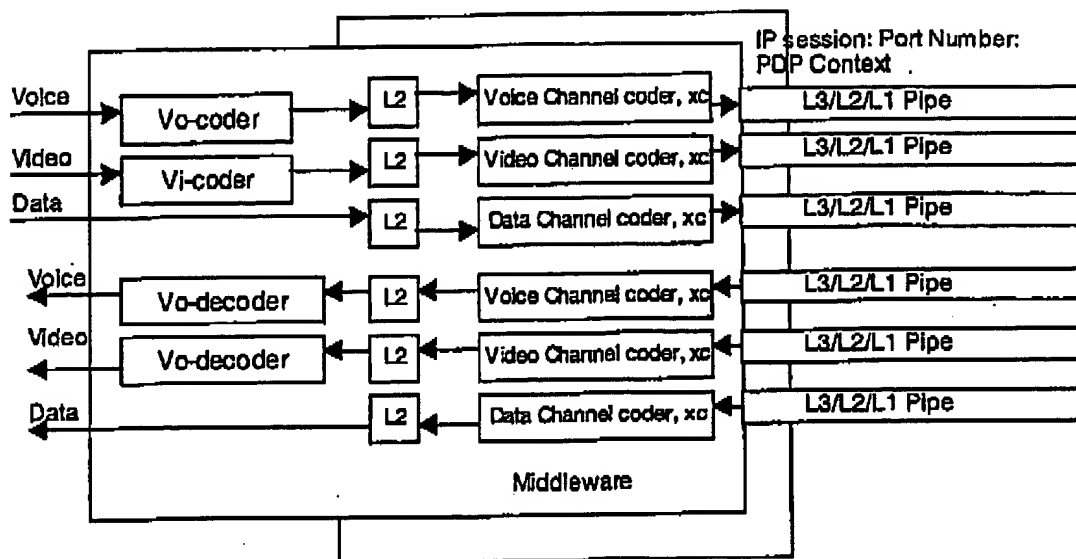


Figure 2: Multimedia Application after Invention

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